

## Weatherization Case Study

**Location:** Singers Glen, VA

**Orientation:** Hilltop facing North-West. Significant window space exists across the back exterior wall facing the South-East.

**Age:** 11 yrs at time of Weatherization (built in 2000)

**Exterior Façade:** All Brick

**Wall Assembly:** 2x4 walls with batted insulation.

### Blower Door Test Results

	Measure of Performance	Before	After	Percent Improvement
<b>Air Tightness</b>	Measured as the airflow needed to create 50 Pascal's of pressure change	4350 CFM@50	3450 CFM@50	21%
<b>Equivalent leak area (EqLa)</b>	The sum total area of leaks throughout the structure's thermal envelope; measured in square inches	580 sq/in EqLa	420 sq/in EqLa	28%

### Overview

The residence offers a clear example of a home that lacked a *Defined Thermal Envelope*. The crawl space was not previously weatherized; allowing air to move freely through vents in the foundation wall and through all the incidental gaps and cracks between joints of wood and concrete. Additionally, there was a lack of insulation between the joist bays under the first floor. This condition creates a very ambiguous line between what is "inside" and "outside" otherwise known as an *Undefined Thermal Envelope*.

Above the living space, the Thermal Envelope was further compromised by poorly insulated knee walls that function as the primary divider between indoor and outdoor temperatures.

### Scope of the Work

#### Basement

- Installation of 12 mil skim reinforced polyethylene, high performance vapor barrier over the existing 6 mil vapor barrier and extended up the foundation wall to the bottom of the floor joists.
- Spray foam was applied in each joist bay at the intersection with the structural band board as well as all of the vertical foundation walls creating an air tight seal around the perimeter of the floor system where unwanted ventilation previously occurred.

### **Attic Walls**

- An air barrier was applied to the exposed surface of batted insulation in the knee walls. Foam insulation was then applied to the air barrier creating an insulated air-tight seal and a *Defined Thermal Envelope* at the upper boundary of the living the space.

### **Can Lights**

- An air-tight seal was created on the attic side of existing recessed lighting to correct a former source of unwanted airflow.

### **Outcome**

The house now has a Defined Thermal Envelope that includes the crawlspace and excludes the attic along clear boundaries.

The results of the blower door test as shown in the table above indicate that drafty areas have been sealed and the home is more energy efficient. The airflow needed to create a 50 Pascal pressure change was decreased by 21% of that measured before we weatherized. The equivalent leakage area was decreased by 28%. This means that the sum total of leaky areas in the house has been reduced by more than ¼!